حل تجميعة أسئلة نهائية وفق الهيكل الوزاري منهج انسباير

موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف العاشر العام ⇦ فيزياء ⇦ الفصل الأول ⇦ حلول ⇦ الملف

تاريخ إضافة الملف على موقع المناهج: 2024-11-26 19:26:07

المزيد من مادة فيزياء:	ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

التواصل الاجتماعي بحسب الصف العاشر العام

صفحة المناهج الإماراتية على فيسبوك					
المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف العاشر العام والمادة فيزياء في الفصل الأول

1	حل مراجعة عامة وفق الهيكل الوزاري منهج انسباير
2	حل مراجعة شاملة وفق الهيكل الوزاري
3	حل مراجعة نهائية وفق الهيكل الوزاري منهج بريدج
4	تجميعة أسئلة صفحات الكتاب وفق الهيكل الوزاري منهج بريدج
5	أسئلة مراجعة نهائية وفق الهيكل الوزاري منهج انسباير

InspirePhysics

Grade 10 – General. AY: 2024 – 2025 . . . Term – 1.

End of Term 1 Final Summative Assessment Preparation.

You may use the following equations			
$\Delta x = x_f - x_i$	$v_f = v_i + \bar{a}\Delta t$	$x_f = x_i + v_i t + \frac{1}{2}\bar{a}t_f^2$	$\bar{v} \equiv \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$
$x = \bar{v}t + x_i$	$v_f^2 = v_i^2 + 2\bar{a}(x_f - x_i)$	$g = 9.8\ \mathrm{m/s^2}$	$\bar{a} \equiv \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$

MULTIPLE CHOICE QUESTIONS (MCQ)

LO – 1. Page: 10. Example Problem 1 Page 12

Use dimensional analysis to validate equations and to choose the appropriate conversion factor when converting units.

EXAMPLE Problem 1

Electric Current The potential difference, or voltage, across a circuit equals the current multiplied by the resistance in the circuit. That is, V (volts) $=$ I (amperes) $\times$ R (ohms). What is the resistance of a lightbulb that has 0.75 amperes current when plugged into a 120-volt outlet?

$V = I \times R$ $R = \frac{V}{I}$	$R = \frac{120}{0.75}$ $R = 160$ ohms

(Past Paper Question ESE):

Based on the linear velocity and acceleration equations, which of the following equations is correct using dimensional analysis?

$$a = \frac{v}{t} \quad \& \quad v = \frac{d}{t}$$

[A] $a \times d = v^2$

[B] $a \times d = v/t$

[C] $a \times d = v/t^2$

[D] $a \times d = v^2/t$

LO – 2. Page: 11. Check your progress 8 Page 13
Identify the significant digits in a given number.

(Question) Solve the following problems, using the correct number of significant figures each time.

	Solutions:
(a)10.8 g − 8.264 g	(a)10.8 g − 8.264 g = 2.54 g
(b)7.45 m − 0.4168 m	(b)7.45 m − 0.4168 m = 7.03 m
(c)139 cm × 2.3 cm	(c)139 cm × 2.3 cm = 320 cm^2 = 3.2 × 10^2 cm^2
(d)13.78 g /11.3 mL	(d)13.78 g /11.3 mL = 1.22 g/mL
(e)6.201 cm + 7.4 cm + 0.68 m + 12.0 cm	(e)6.201 cm + 7.4 cm + 0.68 m + 12.0 cm = 94 cm
(f)1.6 km + 1.62 m + 1200 cm	(f)1.6 km + 1.62 m + 1200 cm = 1600 m + 1.62 m + 1.2 m = 1600 m = 1.6 km

Rule: The result of any arithmetic operation can never be more precise than the least – precise measurement.

(Past Paper Question ESE):
What is the number of significant figures in the number 0.0004020?

a) 4
b) 8
c) 2
d) 7

(Past Paper Question ESE):
What is the answer of (56 + 2.15 + 0.5643), giving the correct number of significant figures in the answer?

a) 59
b) 58
c) 58.7143
d) 58.71

LO – 3. Pages: 17 – 18.
Define and identify independent and dependent variables for a given data set.
The **independent variable** is the factor that is changed or manipulated during the experiment.
The **dependent variable** is the factor that depends on the independent variable.

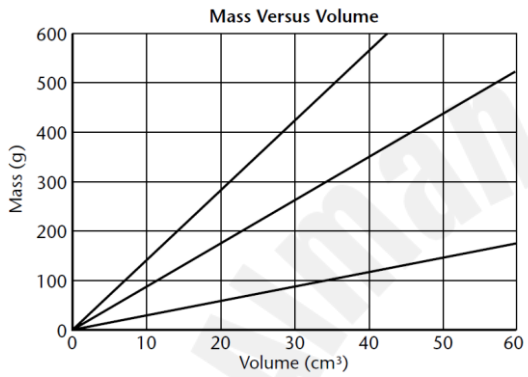
(Past Paper Question ESE):
In a lab experiment to determine the relationship between the length of a pendulum and its period of oscillation, what is the independent variable and the dependent variable?
Independent variable: Length of Pendulum.
Dependent variable: Period of Oscillation.

(Question)
During a laboratory experiment, the temperature of the gas in a balloon is varied and the volume of the balloon is measured. Which quantity is the independent variable? Which quantity is the dependent variable?

Independent variable: The temperature of the gas.
Dependent variable: The volume of the balloon.

As the temperature of the gas changes, the volume of the balloon responds to those changes, making volume dependent on temperature in this setup.

(Question)
The next graph shows the mass of the three substances for volumes between 0 and 60 cm^3.
Which quantity is the independent variable? Which quantity is the dependent variable?

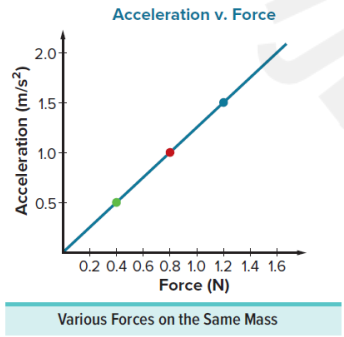


Independent variable: The Volume.

Dependent variable: The mass.

LO – 4. Pages: 19 – 21.
Represent data in graphical form, draw the best fit line, and identify from the shape of the graph if the relationship between the variables is linear, quadratic or inverse.

(Question)
In the next acceleration versus Force Graph, calculate the slope of the linear relationship?



Various Forces on the Same Mass

[A] $0.8\ \frac{(m/s^2)}{N}$

[B] $1.25\ \frac{N}{(m/s^2)}$

[C] $1.25\ \frac{(m/s^2)}{N}$

[D] $0.8\ \frac{N}{(m/s^2)}$

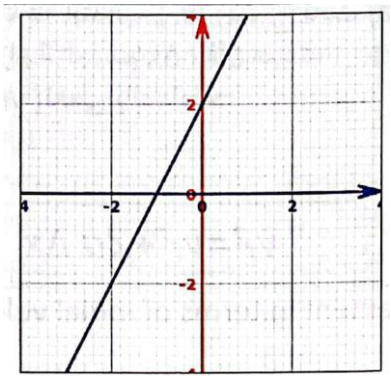
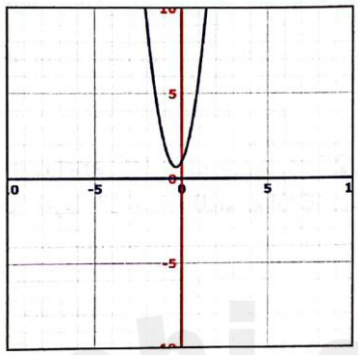
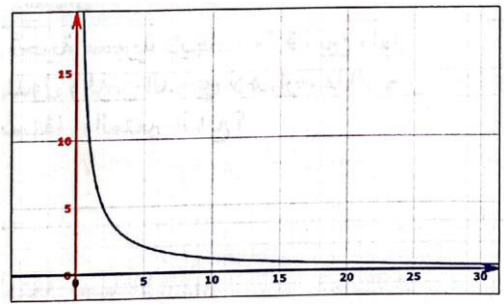
$$\text{Slope} = \frac{\Delta a}{\Delta F}$$

$$\text{Slope} = \frac{1.0 - 0.5}{0.8 - 0.4}$$

$$\text{Slope} = 1.25\ \frac{(m/s^2)}{N}$$

(Past Paper Question ESE):
Match the graph with the correct mathematical relationship below:

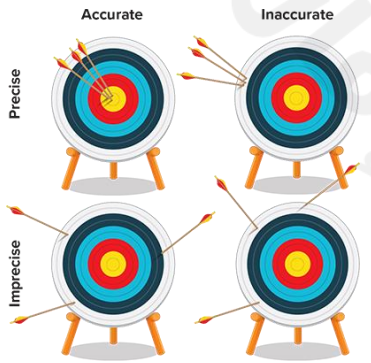
① $y = 2x + 2$, ② $y = \frac{10}{x}$, ③ $y = x^2 + 2x + 1$

①	③	②
		
Linear Function	Quadratic Function (Parabola)	Inverse Function

Find the slope of the line in the first graph.

$\text{Slope} = \frac{\Delta y}{\Delta x}$ $\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$ $(x_1, y_1) = (-1,0)$ $(x_2, y_2) = (0,2)$	$\text{Slope} = \frac{2 - 0}{0 - (-1)}$ $\text{Slope} = 2$

LO – 5. Page: 15. Check your progress 16 Page 17
Compare and contrast precision and accuracy with examples.

The yellow area in the center of each target represents an accepted value for a particular measurement. The arrows represent measurements taken by a scientist during an experiment	
	Precision is a characteristic of a measured value describing the degree of exactness of a measurement. Accuracy is a characteristic of a measured value describes how well the results of a measurement agree with the 'real' value, which is the accepted value, as measured by competent experimenters.

Check your progress

Q 16 A box has a length of 18.1 cm, a width of 19.2 cm, and is 20.3 cm tall.

a. What is its volume?

b. How precise is the measurement of length? Of volume?

c. How tall is a stack of 12 of these boxes?

d. How precise is the measurement of the height of one box? Of 12 boxes?

[a] Volume = Length × Width × Height Volume = 18.1 cm × 19.2 cm × 20.3 cm Volume = 7054.656 cm^3 Volume = 7050 cm^3 (3 Significant Figures) Volume = 7.05×10^3 cm^3	[b] nearest tenth of a cm; nearest 10 cm^3 [c] Height of 12 boxes = $12 \times 20.3 = 234.6$ cm [d] nearest tenth of a cm; nearest tenth of a cm

Q 17 Your friend states in a report that the average time required for a car to circle a 2.4-km track was 65.414 s. This was measured by timing 7 laps using a clock with a precision of 0.1 s. How much confidence do you have in the results of the report? Explain.

You should not have much confidence in the precision of the report. A result can never be more precise than the least precise measurement. The calculated average lap time exceeds the precision possible with the clock.

(Past Paper Question ESE):

Below is a data table produced by four groups of students who were measuring the mass of a paper clip which had a known mass of 1.04 g, which group got a properly precise but not accurate measurement of the mass of the paper clip?

	Group 1	Group 2	Group 3	Group 4
Trial 1 محاولة 1	1.03 g	1.13 g	1.04 g	0.99 g
Trial 2 محاولة 2	1.05 g	1.10 g	1.41 g	1.00 g
Trial 3 محاولة 3	1.02 g	1.11 g	1.52 g	1.19 g

(A) Group 1

(B) Group 2

(C) Group 4

(D) Group 3

LO – 6. Page: 34

Differentiate between scalar and vector quantities with examples

Vector is a quantity with both magnitude and direction.

Scalar is a quantity that has only magnitude.

(Question)

Sort the physical quantities into scalars and vectors.

distance, time, temperature, position, displacement, velocity.

Scalars	Vectors
distance time temperature.	position displacement velocity.

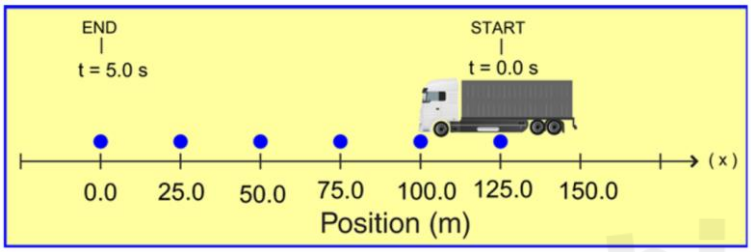
LO – 7. Pages 35 & 36

Calculate the time interval for a given situation using the mathematical representation $\Delta t = t_f - t_i$

Define displacement as the change in an object's position.

(Past Paper Question ESE):

A truck is at a position of $x = 125.0$ m and moves toward the origin $x = 0.0$, as shown in the motion diagram below, what is the velocity of the truck in the given time interval?



[A] -25 m/s

[B] 25 m/s

[C] 125 m/s

[D] -5 m/s

$\bar{v} = \dfrac{x_f - x_i}{t_f - t_i}$

$\bar{v} = \dfrac{0.0 - 125}{5.0 - 0.0}$

$\bar{v} = -25$ m/s

LO – 8. Page: 39. Practice problems 9,10 Page 40

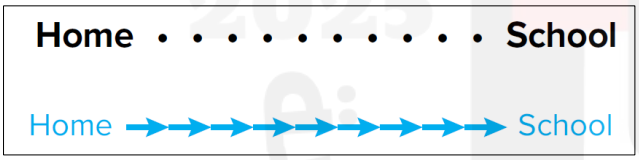
Convert a particle model to a position time graph and vice-vera

PRACTICE PROBLEMS

Q 9 The motion diagram for a boy walking to school is shown below.

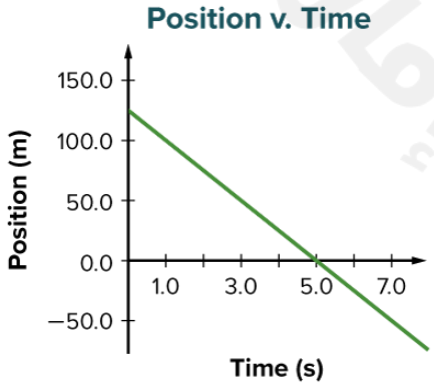
Home • • • • • • • • • • **School**

Make a copy of this motion diagram and draw vectors to represent the displacement between each pair of dots.



Q 10 The graph in Figure 13 represents the motion of a car moving along a straight highway. Describe in words the car's motion.

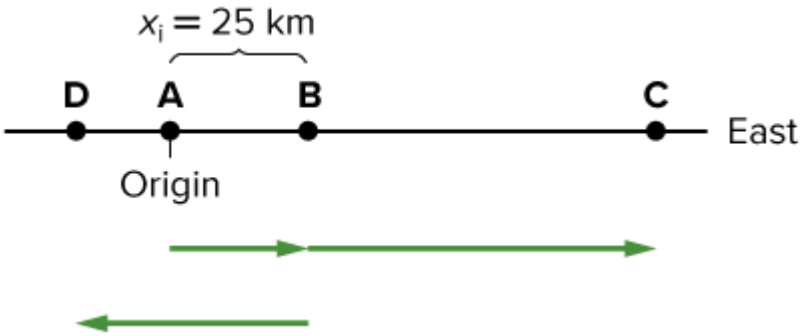
Figure 13



The car begins at a position of 125.0 m and moves toward the origin, arriving at the origin 5.0 s after it begins moving. The car continues beyond the origin.

LO – 9. Practice problems 32,33,34 Page 48
Define and calculate the average speed using a suitable mathematical representation.

For problems 32 - 35, refer to ***Figure 24****.*



Q 32 The diagram at the right shows the path of a ship that sails at a constant velocity of 42 km/h east. What is the ship's position when it reaches point C, relative to the starting point A. if it sails from point B to point C in exactly 1.5 h?

$x = \bar{v}t + x_i$

$x = (42 \times 1.5) + 25$

$x = 88$ km east

Q 33 Another ship starts at the same time from point B, but its average velocity is 58 km/h east. What is its position, relative to A, after 1.5 h?

$x = \bar{v}t + x_i$

$x = (58 \times 1.5) + 25$

$x = 112$ km east

Q 34 What would a ship's position be if that ship started at point B and traveled at an average velocity of 35 km/h west to point D in a time period of 1.2 h?

$x = \bar{v}t + x_i$

$x = (35 \times 1.2) - 25$

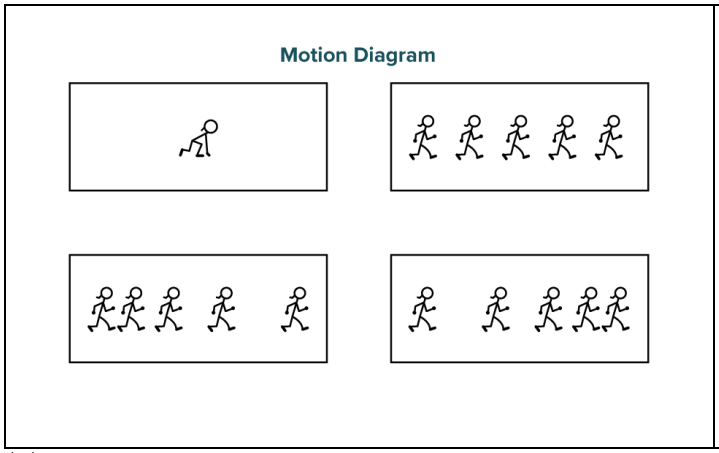
$x = 17$ km west

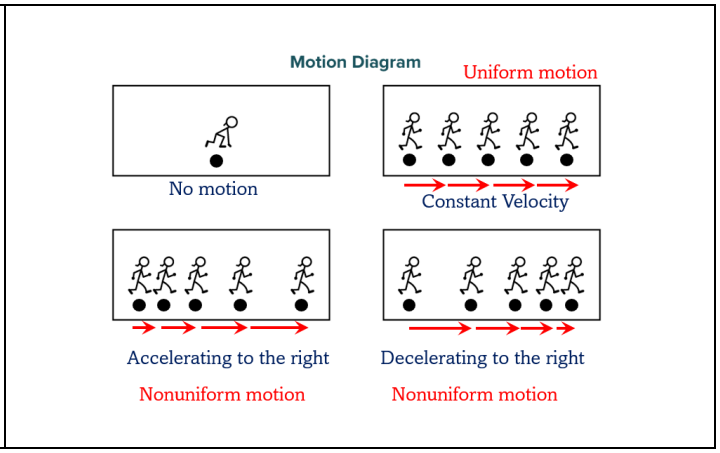
Q 35 Suppose two ships start from point B and travel west. One ship travel at an average velocity of 35 km/h for 2.2 h. Another ship travels at an average velocity of 26 km/h for 2.5 h. What is the final position of each ship?

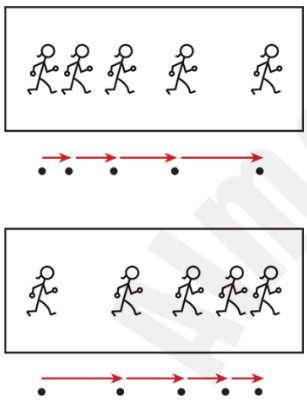
First Ship	Second Ship
$x = \bar{v}t + x_i$	$x = \bar{v}t + x_i$
$x = (35 \times 2.2) - 25$	$x = (26 \times 2.5) - 25$
$x = 52$ km west	$x = 40$ km west

LO – 10. Page 56

Recognize uniform or non-uniform motion from a motion diagram or a particle model.







If an object speeds up, each subsequent velocity vector is longer, and the spacing between dots increases.

If the object slows down, each vector is shorter than the previous one, and the spacing between dots decreases.

(Question)

Describe the particle model motion diagram for a bike rider moving at a constant pace along a straight path.

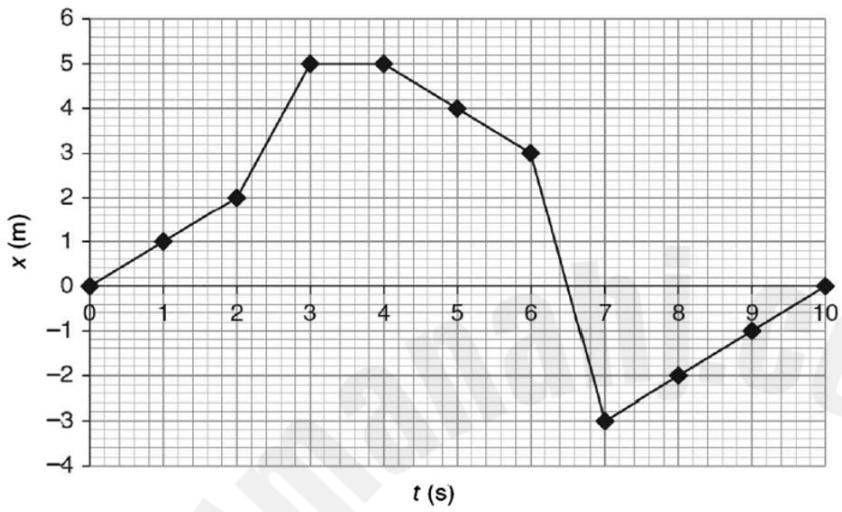
A series of equally spaced dots along a straight line. Each dot represents the position of the bike rider at successive equal time intervals.

LO – 11. Page 58

Describe the motion of an object if its velocity and acceleration are either in the same directions or opposite directions, hence state if an object is slowing down or speeding up.

(Past Paper Question ESE):

The graph below represents the (position – time) for a deer walking in the zoo. During which moment is the deer at rest?



[A] 3.5 s

[B] 8.0 s

[C] 6.5 s

[D] 2.5 s

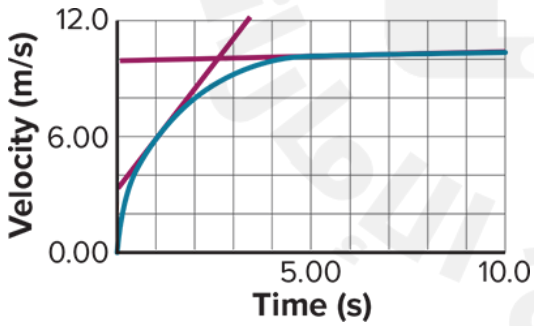
LO – 12. Example Problem 1 Page 62 & Example Problem 2 Page 63

Find the slope and *y*-intercept of a velocity-time graph to describe the motion of an object.

Sprinter

Example Problem – 1.

From the graph, note that the magnitude of the sprinter's velocity starts at zero, increases rapidly for the first few seconds, and then, after reaching about 10.0 m/s, remains almost constant.



How would you describe the sprinter's velocity and acceleration as shown on the graph?

Draw tangents to the curve at two points. Choose $t = 1.00$ s and $t = 5.00$ s. Solve for the magnitude of the instantaneous acceleration at 1.00 s:

$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{10.0\ \text{m/s} - 6.00\ \text{m/s}}{2.4\ \text{s} - 1.00\ \text{s}}$$

$$a = 2.9\ \text{m/s}^2$$

Solve for the magnitude of the instantaneous acceleration at 5.00 s:

$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{10.3\ \text{m/s} - 10.0\ \text{m/s}}{10.0\ \text{s} - 0.00\ \text{s}}$$

$$a = 0.030\ \text{m/s}^2$$

Example Problem – 2:
Describe a ball's motion as it rolls up a slanted driveway. It starts at 2.50 m/s, slows down for 5.00 s, stops for an instant, and then rolls back down. The positive direction is chosen to be up the driveway. The origin is where the motion begins. What are the sign and the magnitude of the ball's acceleration as it rolls up the driveway?

Solution.

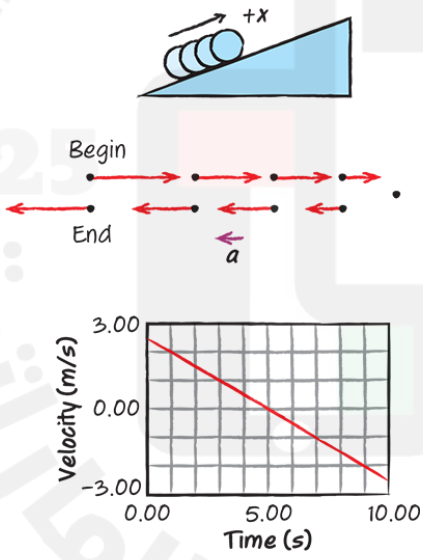
$(0.00, 2.50)$

$(5.00, 0.00)$

$$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$$

$$\bar{a} = \frac{0.00 - 2.50}{5.00 - 0.00}$$

$$\bar{a} = -0.500\ \text{m/s}^2$$



LO – 13. Page 61 & Practice problems 5,6,7 Page 63
Define and calculate the average acceleration

Q 5 A race car's forward velocity increases from 4.0 m/s to 36 m/s over a 4.0-s time interval. What is its average acceleration?

$$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$$

$$\bar{a} = \frac{36 - 4.0}{4.0}$$

$$\bar{a} = 8.0\ \text{m/s}^2$$

Q 6 The race car in the previous problem slows from 36 m/s to 15 m/s over 3.0 s. What is its average acceleration?

$$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$$

$$\bar{a} = \frac{15 - 36}{3.0}$$

$$\bar{a} = -7.0\ \text{m/s}^2$$

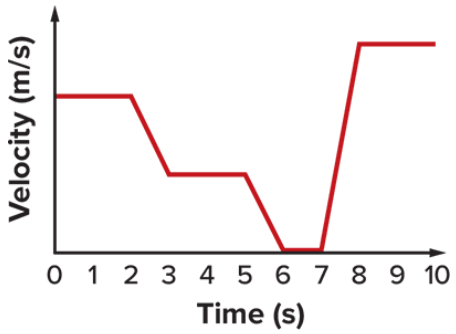
Q 7 A bus is moving west at 25 m/s when the driver steps on the brakes and brings the bus to a stop in 3.0 s.
a. What is the average acceleration of the bus while braking?
b. If the bus took twice as long to stop, how would the acceleration compare with what you found in part a?

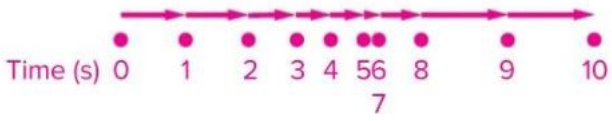
[a]	[b]
$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$	$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$
$\bar{a} = \frac{0.0 - (-25)}{3.0}$	$\bar{a} = \frac{0.0 - (-25)}{6.0}$
$\bar{a} = 8.3\ \text{m/s}^2$ east	$\bar{a} = 4.2\ \text{m/s}^2$ east

LO – 14. Pages 60 – 61 & Example Problem 1 Page 62
Calculate the instantaneous acceleration from a velocity-time graph

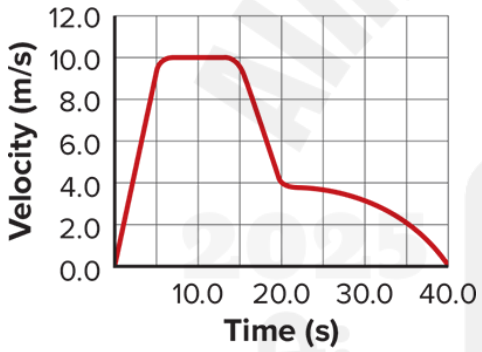
Q (1) The velocity-time graph in Figure 8 describes Steven's motion as he walks along the midway at the state fair. Sketch the corresponding motion diagram. Include velocity vectors in your diagram.

Figure 8





Q (2) Use the $v - t$ graph of the toy train in Figure 9 to answer these questions.
a. When is the train's speed constant?
b. During which time interval is the train's acceleration positive?
c. When is the train's acceleration most negative?



a. 5.0 to 15.0 s

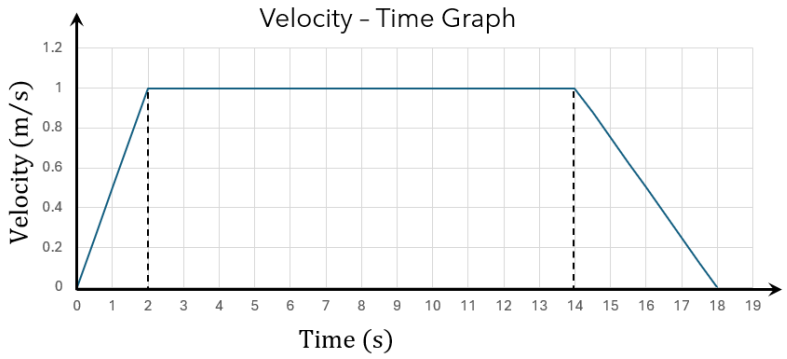
b. 0.0 to 5.0 s

c. 15.0 to 20.0 s

Q (3) Refer to Figure 9 to find the average acceleration of the train during the following time intervals.
a. 0.0 s to 5.0 s
b. 15.0 s to 20.0 s
c. 0.0 s to 40.0 s

[a]	[b]	[c]
$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$	$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$	$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$
$\bar{a} = \frac{10 - 0}{5 - 0}$	$\bar{a} = \frac{4 - 10}{20 - 15}$	$\bar{a} = \frac{0 - 0}{40 - 0}$
$\bar{a} = 2.0\ \text{m/s}^2$	$\bar{a} = -1.2\ \text{m/s}^2$	$\bar{a} = 0.0\ \text{m/s}^2$

Q (4) Plot a $v - t$ graph representing the following motion: An elevator starts at rest from the ground floor of a three-story shopping mall. It accelerates upward for 2.0 s at a rate of $0.5\ \mathrm{m/s^2}$, continues up at a constant velocity of 1.0 m/s for 12.0 s, and then slows down with a constant downward acceleration of $0.25\ \mathrm{m/s^2}$ for 4.0 s as it reaches the third floor.

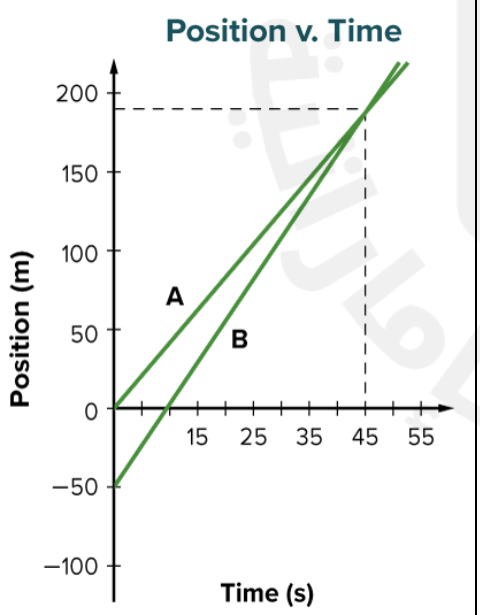


LO – 15. Page 64
Explain how an object can accelerate while moving at a constant speed

What are three ways an object can accelerate?
Speed up, slow down, change direction.

FREE RESPONSE QUESTIONS (FRQ)
LO – 16. Practice problems 15,16,17,18 Page 42. Example problem 1 Practice problems 26, 27,28, 29 Page 46
[1] Interpret a position-time graph that represents the motion of multiple objects
[2] Calculate average velocity (magnitude and direction) from the slope of a position-time graph during a certain time interval and instantaneous velocity from the slope of a position-time graph at a certain instant

The next graph describes the motion of two runners moving along a straight path. The lines representing their motion are labeled A and B.



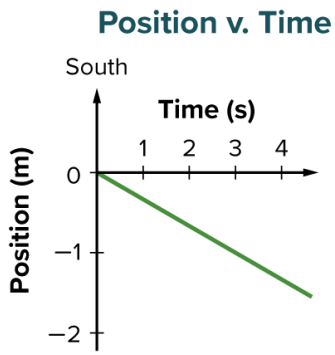
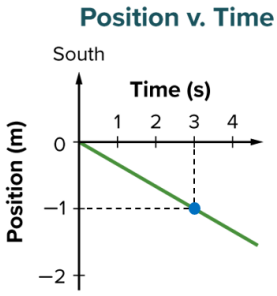
15. Where was runner A located at $t = 0$ s?
Runner A passed the origin.

16. Which runner was ahead at $t = 48.0$ s?
Runner B

17. When runner A was at 0.0 m, where was runner B?
At -50.0 m

18. How far apart were runners A and B at $t = 20.0$ s?
Approximately 30 m

26. The graph in Figure 22 describes the motion of a cruise ship drifting slowly through calm waters. The positive *x*-direction (along the vertical axis) is defined to be south.
a. What is the ship's average speed?
b. What is its average velocity?

Figure 22		Average velocity	Average speed
		$\bar{v} = \frac{x_f - x_i}{t_f - t_i}$ $\bar{v} = \frac{-1 - 0}{3 - 0}$ $\bar{v} = -0.3\ \text{m/s}$ $\bar{v} = 0.3\ \text{m/s north}$	$\overline{\text{speed}} = \lvert\bar{v}\rvert$ $\overline{\text{speed}} = \lvert-0.3\ \text{m/s}\rvert$ $\overline{\text{speed}} = 0.3\ \text{m/s}$

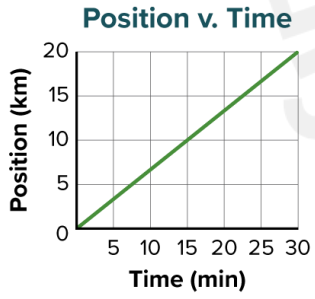
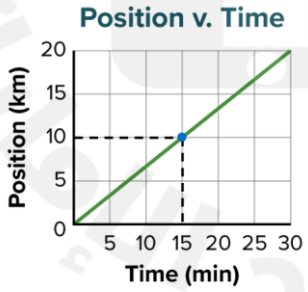
27. Describe, in words, the cruise ship's motion in the previous problem.
The ship is moving north at a speed of 0.3 m/s.

28. What is the average velocity of an object that moves from 6.5 cm to 3.7 cm relative to the origin in 2.3 s?
$\bar{v} = \frac{x_f - x_i}{t_f - t_i}$

$\bar{v} = \frac{3.7 - 6.5}{2.3}$

$\bar{v} = -1.2\ \text{cm/s}$

29. The graph in Figure 23 represents the motion of a bicycle.
a. What is the bicycle's average speed?
b. What is its average velocity?

Figure 23		Average velocity	Average speed
		$\bar{v} = \frac{x_f - x_i}{t_f - t_i}$ $\bar{v} = \frac{10 - 0}{15 - 0}$ $\bar{v} = 0.7\ \text{km/min}\ (+\text{ve})$	$\overline{\text{speed}} = \lvert\bar{v}\rvert$ $\overline{\text{speed}} = \lvert0.7\ \text{km/min}\rvert$ $\overline{\text{speed}} = 0.7\ \text{km/min}$

30. Describe, in words, the bicycle's motion in the previous problem.
The bicycle is moving in the positive direction at a speed of 0.7 km/min.

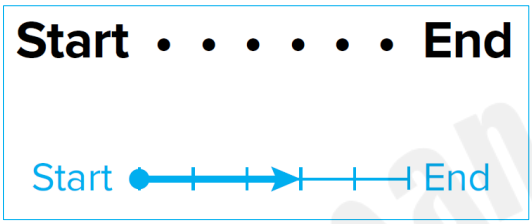
LO – 17. Check your progress 7, 8, 9 Pages 36 – 37. Example problem 4 & Practice problems 32, 33 Page 48
[1] Interpret the motion represented by motion diagrams and particle models
[2] Differentiate between distance travelled and displacement
[3] Determine the resultant displacement using vector addition or subtraction in one dimension
[4]Apply the equation of motion, $\left(x_f = v_{avg}t + x_i\right)$ OR $\left(x_f - x_i = v_{avg}t\right)$ in numerical problems to calculate the position or other physical quantities.

Check your progress

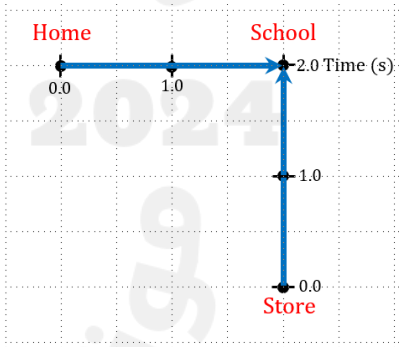
Q (7) The motion diagram for a car traveling on an interstate highway is shown below. The starting and ending points are indicated.

Start • • • • • • End

Make a copy of the diagram. Draw a vector to represent the car's displacement from the starting time to the end of the third time interval.



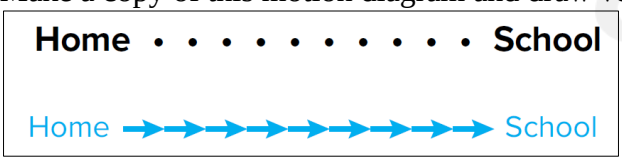
Q (8) Two students added a vector for a moving object's position at $t = 2$ s to a motion diagram. When they compared their diagrams, they found that their vectors did not point in the same direction. What is a possible explanation for this?

A position vector goes from the origin to the object. When the origins are different, the position vectors are different. On the other hand, a displacement vector has nothing to do with the origin.	

Q (9) The motion diagram for a boy walking to school is shown below.

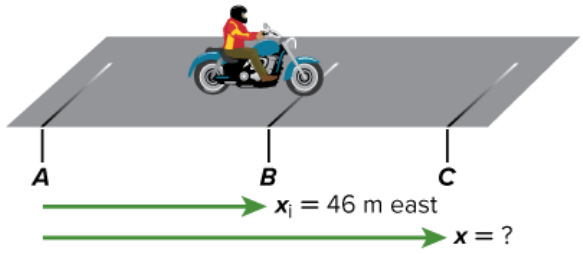
Home • • • • • • • • • • School

Make a copy of this motion diagram and draw vectors to represent the displacement between each pair of dots.



Example problem 4

The figure shows a motorcyclist traveling east along a straight road. After passing point B, the cyclist continues to travel at an average velocity of 12 m/s east and arrives at point C 3.0 s later. What is the position of point C?

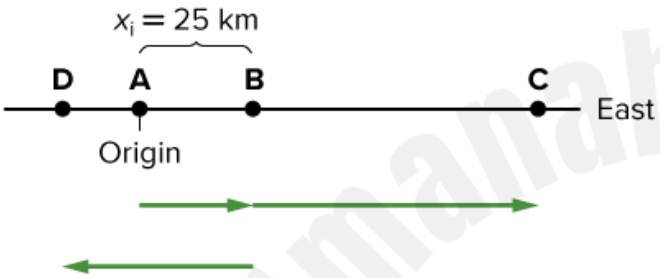


$x = \bar{v}t + x_i$

$x = (12 \times 3.0) + 46$

$x = 82$ m east

For problems 32 - 35, refer to ***Figure 24****.*



32. The diagram at the right shows the path of a ship that sails at a constant velocity of 42 km/h east. What is the ship's position when it reaches point C, relative to the starting point A. if it sails from point B to point C in exactly 1.5 h?

$x = \bar{v}t + x_i$

$x = (42 \times 1.5) + 25$

$x = 88$ km east

33. Another ship starts at the same time from point B, but its average velocity is 58 km/h east. What is its position, relative to A, after 1.5 h?

$x = \bar{v}t + x_i$

$x = (58 \times 1.5) + 25$

$x = 112$ km east

LO – 18. Example problem 3 Page 68. Practice problems 20, 21 Page 68

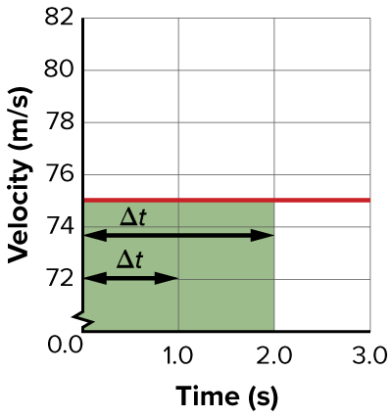
[1] Interpret the velocity-time graph for a single or multiple objects in motion

[2] Calculate the acceleration from the slope of the velocity-time graph

[3] Calculate the displacement as the area under the curve of a velocity-time graph

Example problem 3

The velocity-time graph at the right shows the motion of an airplane. Find the displacement of the airplane for $\Delta t = 1.0$ s and for $\Delta t = 2.0$ s. Let the positive direction be forward.



Displacement = Bounded Area.

For $\Delta t = 1.0$ s

$\Delta x = 1.0 \times 75$

$\Delta x = +75$ m

For $\Delta t = 2.0$ s

$\Delta x = 2.0 \times 75$

$\Delta x = +150$ m

Practice problems

20. The graph in Figure 13 describes the motion of two bicyclists, Akiko and Brian, who start from rest and travel north, increasing their speed with constant acceleration. What was the total displacement of each bicyclist during the time shown for each?

Hint: Use the area of a triangle: $area = \left(\frac{1}{2}\right)(base)(heaight)$

Cyclist A

$\Delta x = \frac{1}{2} \times \text{base} \times \text{height}$

$\Delta x = \frac{1}{2} \times 3.0 \times 6.0$

$\Delta x = 9.0$ m north

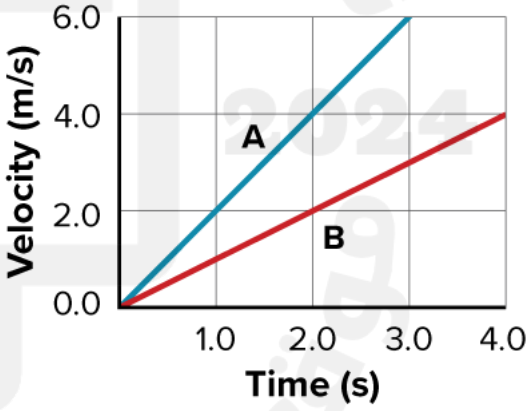
Cyclist A

$\Delta x = \frac{1}{2} \times \text{base} \times \text{height}$

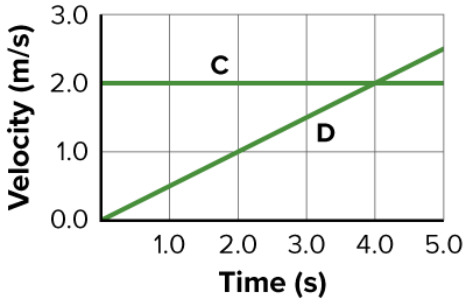
$\Delta x = \frac{1}{2} \times 4.0 \times 4.0$

$\Delta x = 8.0$ m north

Figure 18.



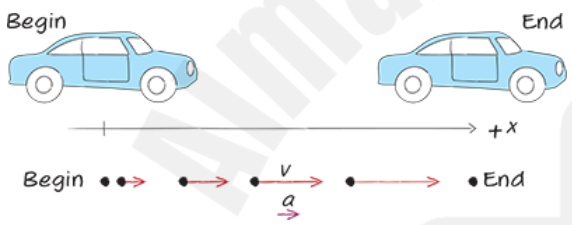
21. The motion of two people, Carlos and Diana, moving south along a straight path is described by the graph in Figure 14. What is the total displacement of each person during the first 4.0-s interval shown on the graph?

Person C	Person D	Figure 14.
$\Delta x = \text{length} \times \text{width}$ $\Delta x = 4.0 \times 2.0$ $\Delta x = 8.0 \text{ m south}$	$\Delta x = \frac{1}{2} \times \text{base} \times \text{height}$ $\Delta x = \frac{1}{2} \times 4.0 \times 2.0$ $\Delta x = 4.0 \text{ m south}$	

LO – 19. Example problem 4,5 Page 70,71 & Practice problems 23,24 Page 70 & Practice problems 28, 30 Page 72
Solve problems using the combination of equations of motion for constant acceleration

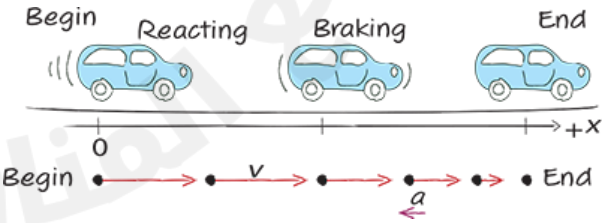
Example problem 4

An automobile starts at rest and accelerates at 3.5 m/s^2 after a traffic light turns green. How far will it have gone when it is traveling at 25 m/s?

	$v_f^2 = v_i^2 + 2\bar{a}(x_f - x_i)$ $25^2 = 0 + 2(3.5)(x_f - 0)$ $x_f = 89 \text{ m}$

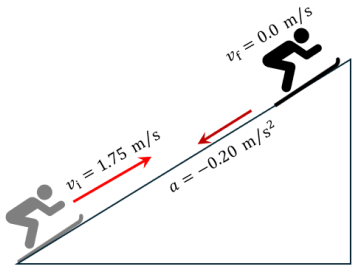
Example problem 5

You are driving a car, traveling at a constant velocity of 25 m/s along a straight road, when you see a child suddenly run onto the road. It takes 0.45 s for you to react and apply the brakes. As a result, the car slows with a steady acceleration of 8.5 m/s^2 in the direction opposite your motion and comes to a stop. What is the total displacement of the car before it stops?

Reacting	Breaking	
$x = \bar{v}t + x_i$ $x = (25)(0.45) + 0.0$ $x = 11.25 \text{ m}$	$v_f^2 = v_i^2 + 2\bar{a}(x_f - x_i)$ $0 = 25^2 + 2(-8.5)(x_f - 0)$ $x_f = 36.7 \text{ m}$	
Total distance $= 11.25 \text{ m} + 36.7 \text{ m} = 48 \text{ m}$		

Practice problems

Q (23) A skateboarder is moving at a constant speed of 1.75 m/s when she starts up an incline that causes her to slow down with a constant acceleration of $-0.20\ \text{m/s}^2$. How much time passes from when she begins to slow down until she begins to move back down the incline?

$v_f = v_i + \bar{a}\Delta t$ $0 = 1.75 + (-0.20)(\Delta t)$ $\Delta t = 8.75\ \text{s}$ $\Delta t = 8.8\ \text{s}$	

Q (24) A race car travels on a straight racetrack with a forward velocity of 44 m/s and slows at a constant rate to a velocity of 22 m/s over 11 s. How far does it move during this time?

$\bar{a} = \frac{v_f - v_i}{t_f - t_i}$ $\bar{a} = \frac{22 - 44}{11}$ $\bar{a} = -2\ \text{m/s}^2$	$x_f = x_i + v_i t + \frac{1}{2}\bar{a}t_f^2$ $x_f = 0 + (44 \times 11) + \frac{1}{2}(-2)(11)^2$ $x_f = 363\ \text{m}$ $x_f = 360\ \text{m}$ (2 Significant Figures)

Practice problems

28. A car with an initial velocity of 24.5 m/s east has an acceleration of $4.2\ \text{m/s}^2$ west. What is its displacement at the moment that its velocity is 18.3 m/s east?

$v_f^2 = v_i^2 + 2\bar{a}(x_f - x_i)$

$18.3^2 = 24.5^2 + 2(-4.2)(x_f - 0)$

$x_f = 32\ \text{m east}$

30. You start your bicycle ride at the top of a hill. You coast down the hill at a constant acceleration of $2.00\ \text{m/s}^2$. When you get to the bottom of the hill, you are moving at 18.0 m/s, and you pedal to maintain that speed. If you continue at this speed for 1.00 min, how far will you have gone from the time you left the hilltop?

The nonuniform motion period	The uniform motion period	
$v_f^2 = v_i^2 + 2\bar{a}(x_f - x_i)$ $18.0^2 = 0.0^2 + 2(2.0)(\Delta x)$ $\Delta x = 81\ \text{m}$	$\Delta x = v\,t$ $\Delta x = (18.0)(1.00 \times 60)$ $\Delta x = 1080\ \text{m}$	$(\Delta x)_{\text{total}} = 81 + 1080$ $(\Delta x)_{\text{total}} = 1161\ \text{m}$ $(\Delta x)_{\text{total}} = 1.161\ \text{km}$

the end